Rewarding Learning

Centre Number	
71	

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2012

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[AB121]

AB121

FRIDAY 15 JUNE, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
There is an extra lined page at the end of the paper if required.
Answer **all eight** questions.
You are provided with **Photographs 2.5A and B** for use with **Question 5** in this paper. Do not write your answers on these photographs.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.
Section A carries 60 marks. Section B carries 15 marks.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You are reminded of the need for good English and clear presentation in your answers.
Use accurate scientific terminology in all answers.
You should spend approximately **20 minutes** on Section B.
You are expected to answer Section B in continuous prose.
Quality of written communication will be assessed in **Section B**, and awarded a maximum of 2 marks.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Section A

Examiner Only	
Marks	Remark

1 Various reagents are used to investigate aspects of gas exchange.

(a) The J-tube is used to analyse the relative amounts of gases in air. Name the gas(es) absorbed by using each of the following reagents when using the J-tube.

- Potassium hydroxide

_____

- Potassium pyrogallate

_____ [2]

(b) Hydrogencarbonate (bicarbonate) indicator solution changes colour as the level of carbon dioxide changes from that in atmospheric air.

State the colour change that you would expect in each of the following conditions.

- Increasing CO_2 levels

_____

- Decreasing CO_2 levels

_____ [2]

Examiner Only	
Marks	Remark

2 Clusters of mushrooms growing in a circle are often referred to as 'fairy rings' because they were once thought to be caused by fairies dancing in a ring. In reality they grow in grassland and woodland where there are large amounts of dead organic matter within the soil. One particular species that grows in this way is *Marasmius oreades*.

A ring starts when a single spore germinates and grows outwards, using the dead organic material as a source of nutrition, and forms a circular growth of hyphae (mycelium). The mushrooms, which are the reproductive structures, only appear later, when sufficient mycelial mass has been generated to support them.

(a) (i) Identify the kingdom to which organisms like *Marasmius oreades* belong.

_____ [1]

(ii) State **one** cellular feature which is characteristic of the organisms in this kingdom.

_____

_____ [1]

(b) (i) Explain how *M. oreades* obtains nutrients from the dead organic matter.

_____

_____

_____

_____

_____

_____ [3]

(ii) To enable them to make full use of the dead plant material, organisms like *M. oreades* produce enzymes that are not found in animals. Suggest **one** such enzyme.

_____ [1]

Examiner Only	
Marks	Remark

3 Fick's Law describes factors which affect exchange across a surface.

While mammals have lungs for gas exchange, many other animals, such as fish, have gills.

(a) With reference to Fick's Law, suggest **three** features which you would expect the gills of fish to possess, and, for each feature, explain how it maximises exchange.

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____ [3]

(b) State the name of the tissue which acts as the gas exchange surface in a leaf.

_____ [1]

Examiner Only	
Marks	Remark

4 'Mass flow' is the term given to transport mechanisms which involve the use of a force to move large amounts of substances.

(a) Ventilation in mammals is an example of transport involving mass flow.

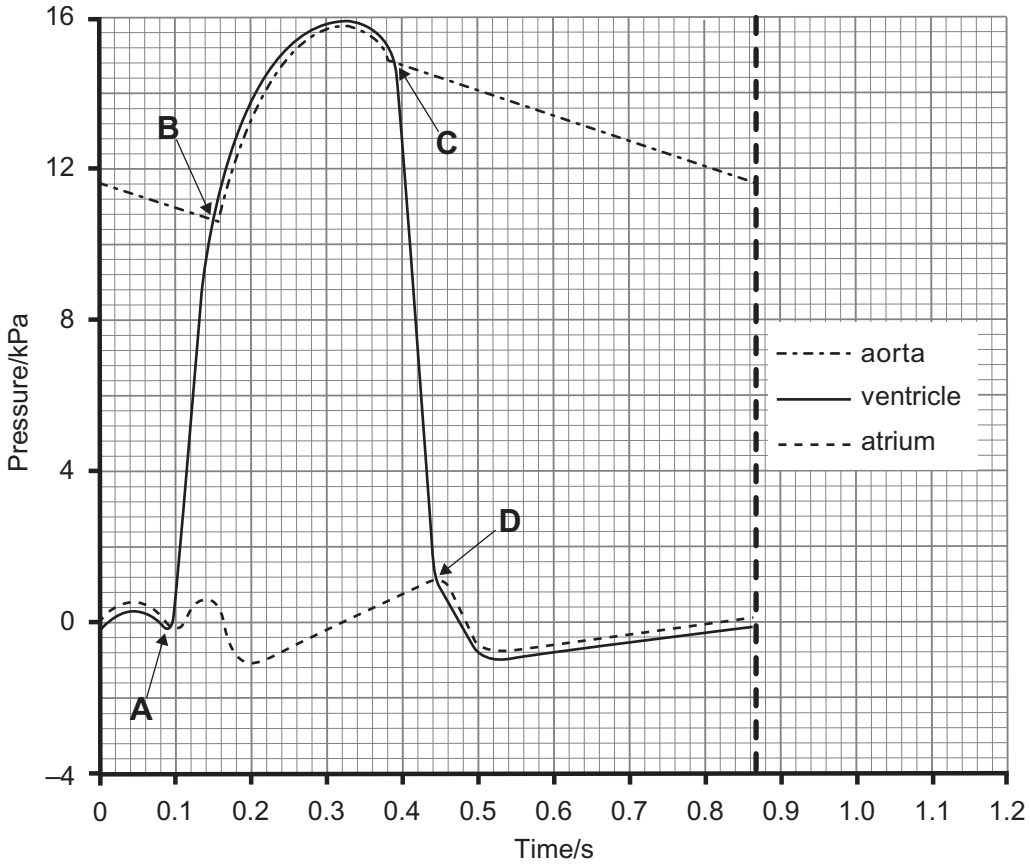
Describe how mass flow of air out of the lungs is achieved during expiration.

[4]

The circulatory system in mammals is another example of a mass flow transport system. Here, the force is provided by the contraction of the heart which pumps blood through the blood vessels.

Examiner Only	
Marks	Remark

(b) The graph below shows the pressure changes in the left side of the heart during a cardiac cycle.



(i) State which letter **A**, **B**, **C** or **D** represents the following events in the cardiac cycle:

- the opening of the atrio-ventricular valve _____
- the closing of the aortic (semi-lunar) valve _____ [2]

(ii) Explain the following:

- the increase and decrease in atrial pressure between 0 and 0.1 s

_____

_____

_____

_____ [2]

- the increase in aortic pressure between 0.16 and 0.3 s

_____

_____

_____

_____ [2]

(iii) Identify the phase of the cardiac cycle which takes place between **A** and **C**.

_____ [1]

(c) Contraction of the heart is initiated within cardiac muscle and does not need to receive impulses from the nervous system.

(i) State the term that is used to describe contraction originating within the muscle.

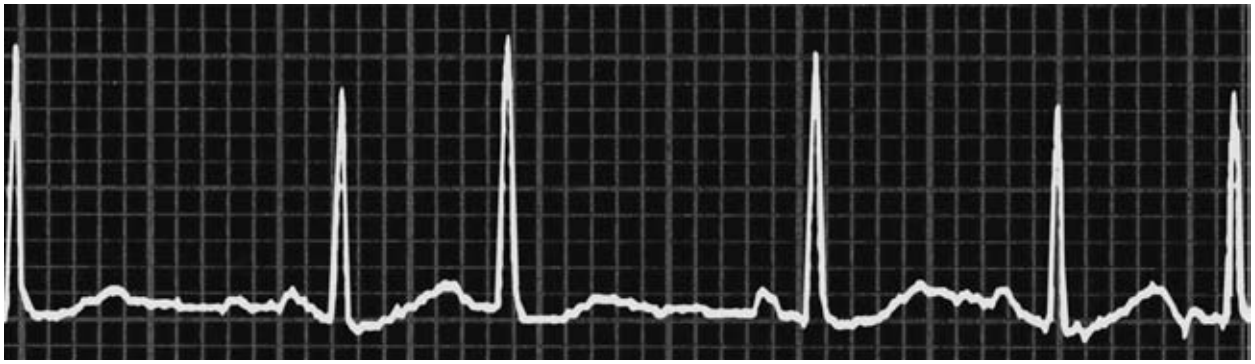
_____ [1]

(ii) Name the region of the heart which sets the pace of contraction, thus acting as the pacemaker.

_____ [1]

Examiner Only	
Marks	Remark

(d) The electrical activity of the heart can be monitored and displayed in an electrocardiogram (ECG). An example of an ECG trace is shown below.



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What is the evidence that the individual, for whom the trace was made, had an irregular heartbeat?

_____

_____ [1]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

5 **Photographs 2.5A** and **2.5B** show two types of vascular tissue found in a stem – xylem and phloem. Both tissues are involved in transport, xylem carrying water and ions and phloem carrying the products of photosynthesis.

(a) State **two** ways in which the process of transport in the xylem differs from that in the phloem.

1. _____

_____

_____

2. _____

_____

_____ [2]

(b) Identify the tissue shown in **photograph 2.5A** and the structure labelled **Z** in the photograph.

Tissue _____

Structure **Z** _____ [2]

(c) Below is a diagram representing a stem.

Draw a line on the diagram below to indicate the direction in which the stem was cut in order to produce the sections shown in the photographs.

[1]

(d) The tissue shown in **photograph 2.5B** is relatively young. Identify the evidence for this and explain the benefit of this feature being found in young tissue.

Examiner Only

Marks	Remark

_____

_____

_____

_____

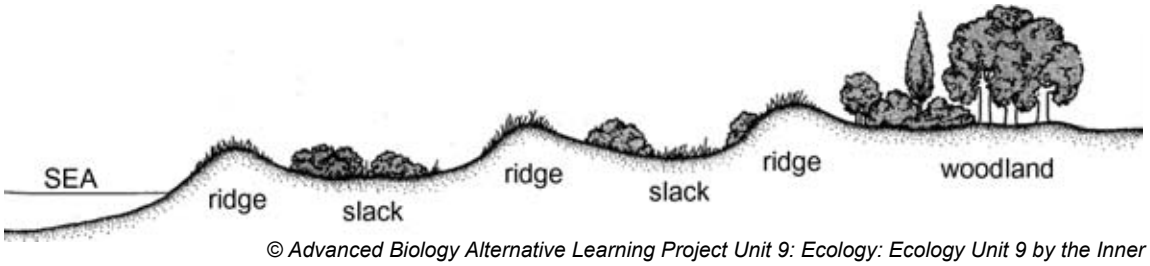
_____ [2]

(e) Calculate the actual length, in micrometres (μm), of the structure labelled **Z** in **photograph 2.5A**. The magnification is shown in the photograph. (Show your working.)

_____ μm [3]

Examiner Only	
Marks	Remark

6 A sand dune system consists of a series of dune ridges, separated by dune slacks, as shown in the diagram below.



A group of students compared the distribution of plants on a dune ridge with that in a dune slack. They used a random sampling method to investigate the plants found on a dune ridge and in the dune slack behind it.

(a) Describe a random sampling method which the students could use to investigate the relative abundance of the different plant species present.

[4]

Examiner Only	
Marks	Remark

(b) In addition to sampling the plants growing in the dune system, the students also measured some abiotic factors in the two areas. These included soil moisture and wind speed.

In order to measure the soil moisture, five cores of soil were removed from each area being investigated. Each sample was weighed in the laboratory and then heated in a microwave oven for 10 minutes. It was then reweighed and placed in the microwave for a further 5 minutes. This process of heating and reweighing was repeated until no further change in mass was observed.

(i) Suggest the reason for this repeated heating and reweighing.

_____

_____ [1]

(ii) State the term used to describe abiotic factors related to the soil and give **one** example of such a factor, other than soil moisture.

Term _____

Example _____ [2]

Some of the results of the investigation are shown in the table below.

Species	Abundance	
	Dune ridge	Dune slack
Marram grass	112	4
Fescue grass	36	25
Portland spurge	20	0
Catsear	13	27
Thyme	0	34
Mosses	0	164

(c) Plot the above results, using an appropriate graphical technique. (Use the graph paper opposite.) [4]

(d) The area around the dune slack supported a population of rabbits which fed upon the plants growing there. As a result, individual plants were very small and most students required the use of a magnifying lens to examine them.

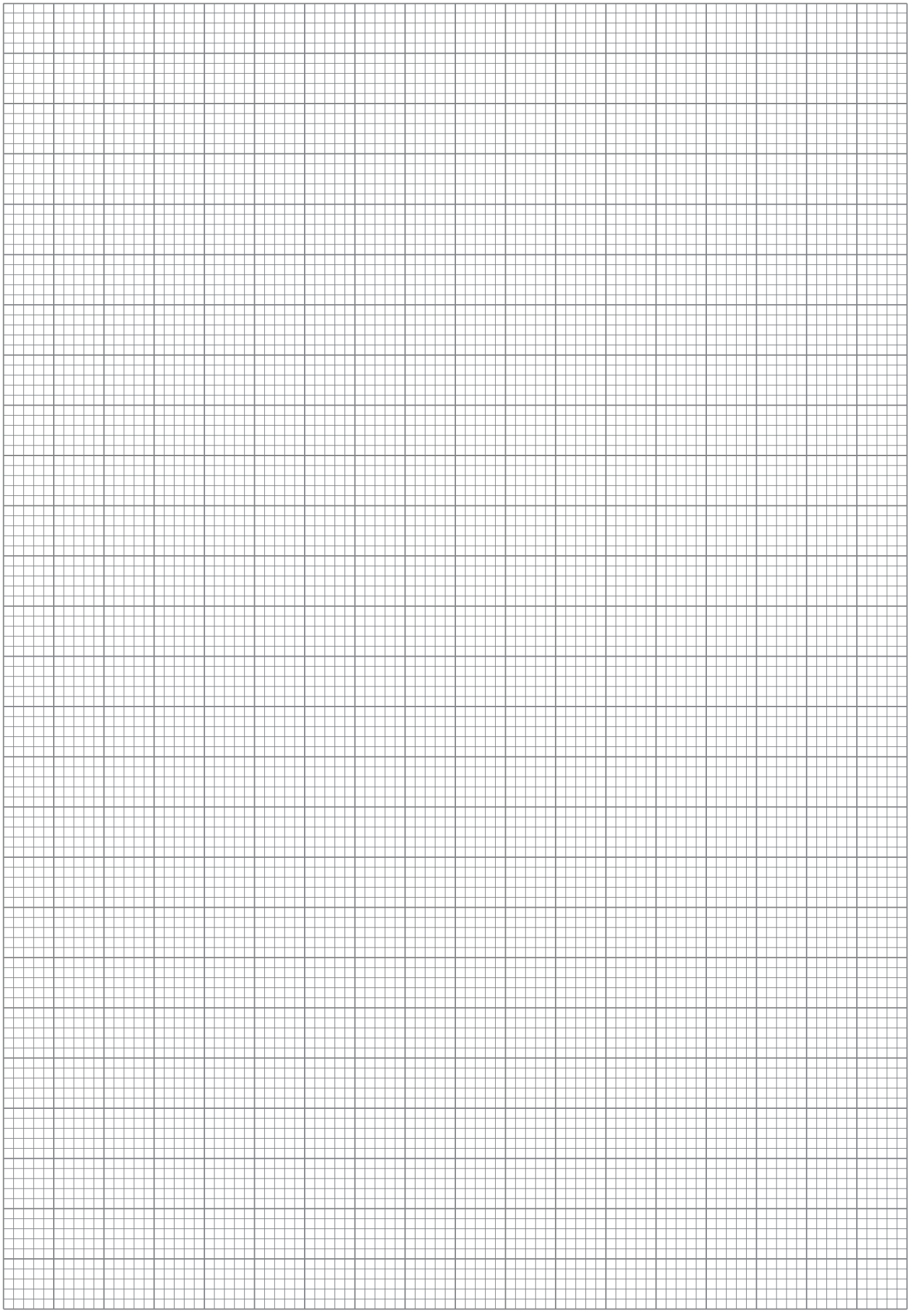
Explain how this may have affected the accuracy of the results for the dune slack.

_____

_____ [1]

Examiner Only

Marks	Remark



Examiner Only	
Marks	Remark

7 **(a)** The red squirrel (*Sciurus vulgaris*), which is native to Ireland, is related to chipmunks, marmots and prairie dogs and is included in a taxonomic group called the Sciuridae. All Sciuridae belong to a group of mammals called the Rodentia.

Using this information, complete the following table concerning the taxonomy of the red squirrel.

Kingdom	Animalia
	Chordata
Class	
Order	
Family	
Genus	
Species	

[3]

(b) There are an estimated 40 000 red squirrels throughout Ireland. However the range of this indigenous species is rapidly contracting as grey squirrels (*Sciurus carolinensis*), which were introduced from North America, continue to spread and outcompete reds. Some information about both red and grey squirrels is given in the table below.

Feature	Red squirrel	Grey squirrel
Body length	20–22 cm	25–27 cm
Body mass	275–305 g	540–660 g
Body shape	Slender	Stocky
Habitat	Mainly coniferous forest	Broadleaf forest
Diet	Seeds, nuts, buds and berries	Same as red, plus acorns (particularly big seeds); can eat seeds that are not fully ripe
Feeding area	Mainly in the tree canopy	Mainly on the ground
Breeding	2–3 litters per year with 3–4 kittens per litter	3–4 litters per year with 5–6 kittens per litter

(i) Using the information in the table, suggest explanations as to how the grey squirrels are able to outcompete the red squirrels.

[4]

(ii) Throughout Ireland there are many conservation projects aimed at increasing the population of red squirrels. One way is to provide supplementary feeding for the red squirrels and suitable food hoppers are currently in use at some of Ireland's forest parks.

Using information from the table, suggest and explain how food hoppers could be designed and placed in such a way as to favour the red squirrels.

Design

Placement

[2]

(iii) Suggest **one** other way in which forestry management could encourage the spread of red squirrels.

[1]

Examiner Only

Marks	Remark

Section B

Examiner Only	
Marks	Remark

Quality of written communication is awarded a maximum of 2 marks in this section.

8 Give an account of the role of the following components of blood and explain any adaptations which they might have.

- Erythrocytes (red blood cells)
- White blood cells (polymorphs, monocytes and lymphocytes)
- Platelets and plasma proteins [13]

Quality of written communication [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

Extra lined page

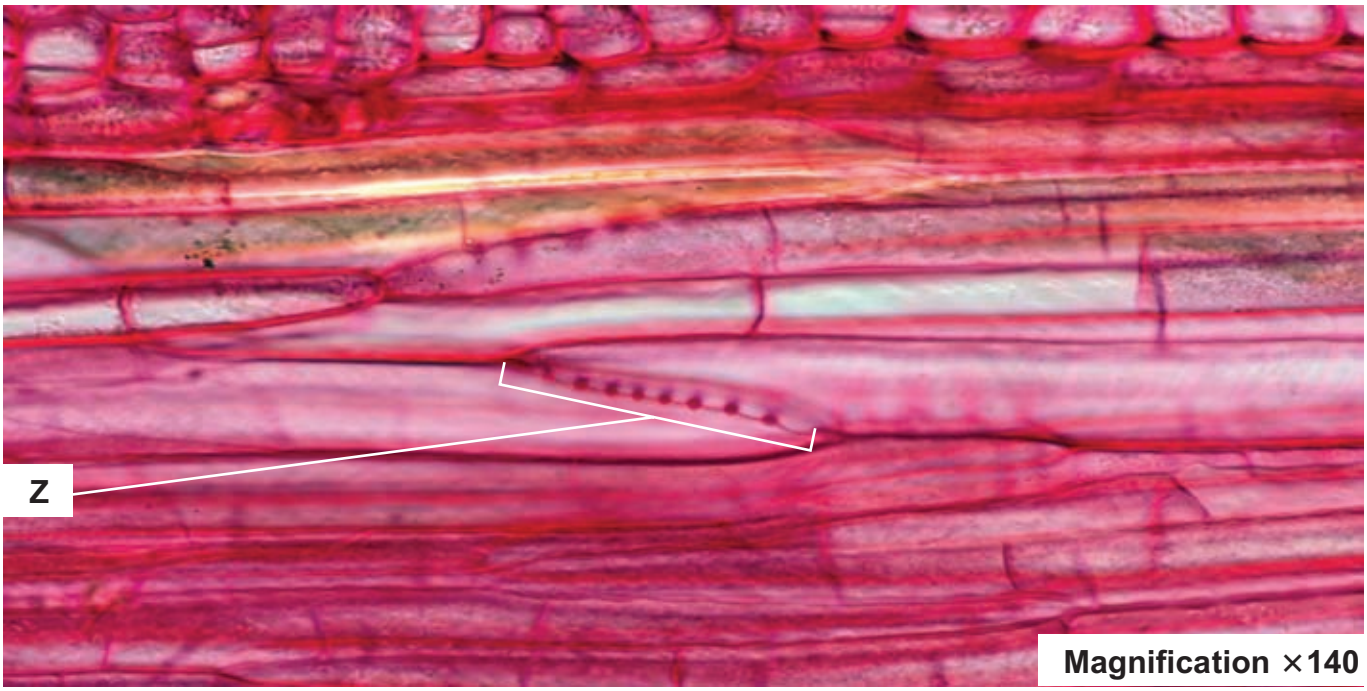
Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

112125

GCE Biology Advanced Subsidiary (AS)
Assessment Unit AS 2: Organisms and Biodiversity
June 2012

Photograph 2.5A



Photograph 2.5B